

ACTUATING ROD IN A DIAPHRAGM PUMP

1 BACKGROUND OF THE INVENTION

2 1. Field of the Invention

3 The present invention relates to an actuating rod, and more particularly
4 to an actuating rod in a diaphragm pump. The actuating rod is composed of
5 permanent magnets enclosed inside a casing having a base and caps each having
6 claws extending out to correspond to positioning holes in the casing such that the
7 magnetic force of the permanent magnets will not be influenced by high
8 temperature from the manufacturing process °

9 2. Description of Related Art

10 An air pump (6), as shown in Fig. 3, is equipped with two coils (61)
11 arranged in parallel with each other, an actuating rod (62) movably located
12 between the two coils (61) and two diaphragms (63) each provided on one side of
13 the actuating rod (62) such that when the air pump (6) is activated and the
14 actuating rod (62) is moved by the magnetic attraction and repellent forces
15 exerted between the electromagnets and the permanent magnets attached to the
16 rod, the two diaphragms (63) are driven accordingly and thus air is pumped
17 through air ducts (64A,64B).

18 With reference to Fig. 4, it is noted that the actuating rod (62) is
19 composed of permanent magnets (621) and a casing (622) enclosing therein the
20 permanent magnets (621). The casing (622) is injection molded and thus the
21 permanent magnets (621) are embedded inside the casing (622). During the
22 formation of the casing (622), magnetic force of the permanent magnets (621) is

1 influenced by high temperature from the manufacturing process such that the
2 magnetic force of the actuating rod (62) is reduced and the pressure from the air
3 pressure induced by the movement of the diaphragms (63) is weak. Furthermore,
4 even after the actuating rod is formed by injection molding and then the two
5 permanent magnets are magnetized, because the two magnets are too close to
6 each other and each has a polarity opposite to one another, the magnetization
7 process would be difficult and expensive. Another conventional structure applies
8 an adhesive agent to securely engage the magnet with the actuating rod. Due to
9 the high repellent force between the two elements, the two elements will
10 overcome the adhesive force and eventually separate from each other. Still
11 another conventional structure applies a rivet to securely mount the actuating rod
12 on the magnet. However, defining a hole in the magnet dramatically reduces the
13 magnetic force of the magnet, which is a major drawback of this kind of structure.
14 Therefore, the existing magnets are maintained to have large size to provide the
15 necessary magnetic force. The large size of the magnets results in large size of
16 the actuating rod, which can not accomplish the predetermined goal that the
17 actuating rod is compact and able to provide necessary magnetic force.
18 Therefore, modification is necessary to overcome the shortcoming.

19 To overcome the shortcomings, the present invention tends to provide an
20 improved actuating rod in a diaphragm pump to mitigate the aforementioned
21 problems.

22 SUMMARY OF THE INVENTION

23 The primary objective of the present invention is to provide an improved

1 actuating rod securely sandwiched between a base and caps such that the
2 magnetic force of the permanent magnets is not influenced by the manufacturing
3 process and thus the pumping speed is high and the pressure of the air is strong.

4 In order to accomplish the foregoing objective, the casing having a base
5 and caps each having claws extending out to correspond to positioning holes in
6 the base such that after the magnets are placed inside the corresponding caps and
7 the claws extend into the corresponding positioning holes, the assembly of the
8 actuating rod is finished. Thus, the magnetic force will not be influenced by the
9 manufacturing process.

10 Other objects, advantages and novel features of the invention will
11 become more apparent from the following detailed description when taken in
12 conjunction with the accompanying drawings.

13 BRIEF DESCRIPTION OF THE DRAWINGS

14 Fig. 1 is an exploded perspective view of the actuating rod of the present
15 invention;

16 Fig. 2 is a perspective view showing the assembled actuating rod of the
17 present invention;

18 Fig. 3 is a top view showing movement of a conventional actuating rod
19 of a conventional diaphragm pump; and

20 Fig. 4 is a perspective view showing the conventional actuating rod.

21 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

22 With reference to Fig. 1, the actuating rod in accordance with the present
23 invention includes a casing (1) and permanent magnets (2).

1 The casing (1) is composed of a base (11) and caps (12). The base (11)
2 has openings (111) with a quantity corresponding to a quantity of the permanent
3 magnets (2) and the caps (12) and positioning holes (112) defined along a
4 contour of each of the openings (111).

5 The cap (12) has a retaining opening (121), a flange (122) formed on an
6 inner side face defining the retaining opening (121) and claws (123) extending
7 out along a contour of the cap (12) to correspond to the positioning holes (112) of
8 the base (11).

9 When the actuating rod of the present invention is in assembly, the
10 permanent magnets (2) are received in the retaining openings (121) of the caps
11 (12) and supported by the corresponding flanges (122). Then the caps (12)
12 together with the permanent magnets (2) are connected to the base (11) by
13 extending the claws (123) into the corresponding positioning holes (112) of the
14 base (11). Because each of the claws (123) has an L-shaped cross section, after
15 the extension of the claws (123) into the corresponding positioning holes (112),
16 the caps (12) are securely combined with the base (11) and thus the permanent
17 magnets (2) are securely sandwiched between the base (11) and the caps (12).

18 During the assembly of the actuating rod of the present invention, it is
19 noted that there is no factor to influence the magnetic force of the permanent
20 magnets (2) so that the magnetic force of the permanent magnets (2) is
21 maintained. Therefore, the pumping speed, i.e. air volume pumped per minute
22 measured by litres per minute, is high and the pressure induced by the movement
23 of the diaphragm is strong.

1 It is to be understood, however, that even though numerous
2 characteristics and advantages of the present invention have been set forth in the
3 foregoing description, together with details of the structure and function of the
4 invention, the disclosure is illustrative only, and changes may be made in detail,
5 especially in matters of shape, size, and arrangement of parts within the
6 principles of the invention to the full extent indicated by the broad general
7 meaning of the terms in which the appended claims are expressed.